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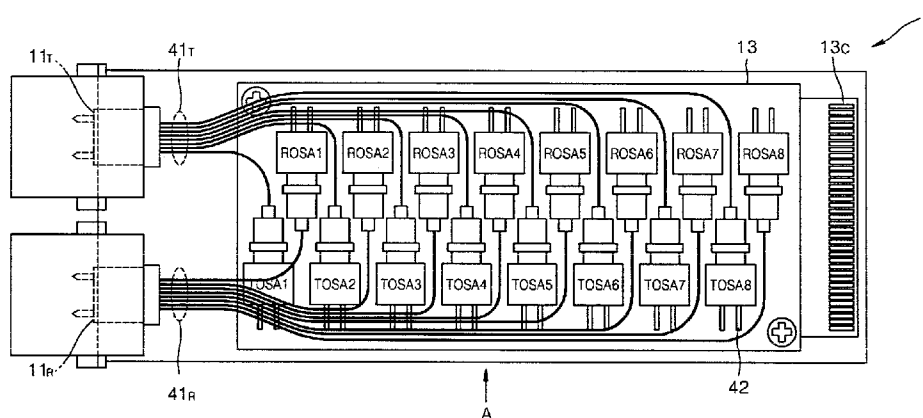
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(57) Abstract: Since light receiving device arrays and the light emitting device arrays are used in a conventional optical transceiver, the following problems exist. First, optical crosstalk occurs between adjacent channels. Second, gaps between electrical lines connected to the light receiving device arrays and the light emitting device arrays are small, and thus electrical crosstalk between adjacent channels occurs. Third, when manufacturing the optical transceiver, it is difficult to arrange end parts of optical fiber arrays in a to accurately face the light receiving device arrays and the light emitting device arrays, and thus manufacturing costs are high. The optical transceiver according to the present invention converts optical signals of a plurality of channels from a first side into electrical signals so as to output the electrical signals to a second side and converts electrical signals of a plurality of channels from the second side into optical signals so as to output the optical signals to the first side. The optical transceiver includes a case; single channel light receiving assemblies located inside the case, comprising light receiving devices for detecting the optical signals of the channels from the first side; and single channel light emitting assemblies located inside the case, comprising light emitting devices operated by the electrical signals of the channels from the second side.

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## OPTICAL TRANSCEIVER

### TECHNICAL FIELD

The present invention relates to an optical transceiver, and more particularly, to an optical transceiver which converts a plurality of optical signals input from a first side into electrical signals so as to output the electrical signals to a second side and converts a plurality of electrical signals input from the second side into optical signals so as to output the optical signals to the first side.

### BACKGROUND ART

In a conventional optical transceiver including a plurality of channels, end parts of optical fiber arrays of the channels are arranged to face light receiving device arrays and light emitting device arrays in the optical transceiver. Such an optical transceiver is disclosed in Japanese Patent Application Publication No. 2002-311310.

Since light receiving device arrays and light emitting device arrays are used in a conventional optical transceiver, the following problems exist.

First, optical crosstalk occurs between adjacent channels.

Second, gaps between electrical lines connected to the light receiving device arrays and the light emitting device arrays are small, and thus electrical crosstalk between adjacent channels occurs.

Third, when manufacturing the optical transceiver, it is difficult to arrange the end parts of the optical fiber arrays to accurately face the light receiving device arrays and the light emitting device arrays, and thus manufacturing costs are high.

### DETAILED DESCRIPTION OF THE INVENTION

#### TECHNICAL PROBLEM

The present invention provides an optical transceiver including a plurality of channels, which prevents optical and electrical crosstalk between channels adjacent to each other and reduces a cost of manufacturing the optical transceiver.

## TECHNICAL SOLUTION

According to an aspect of the present invention, there is provided an optical transceiver which converts optical signals of a plurality of channels input from a first side into electrical signals so as to output the electrical signals to a second side and converts electrical signals of a plurality of channels input from the second side into optical signals so as to output the optical signals to the first side, the optical transceiver including: a case; single channel light receiving assemblies located inside the case, comprising light receiving devices for detecting the optical signals of the channels from the first side; and single channel light emitting assemblies located inside the case, comprising light emitting devices operated by the electrical signals of the channels from the second side.

## ADVANTAGEOUS EFFECTS

In an optical transceiver according to the present invention, opto-electric conversion and electro-optic conversion are performed within each of single channel light receiving assemblies and single channel light emitting assemblies located inside a case. Accordingly, the following effects can be obtained.

First, optical crosstalk does not occur between adjacent channels.

Second, since a gap between electrical lines connected to each of the single channel light receiving assemblies and the single channel light emitting assemblies can be widened, electrical crosstalk between adjacent channels can be reduced.

Third, since the end parts of optical fibers do not need to be arranged to face the light receiving devices and the light emitting devices during a process of manufacturing the optical transceiver, manufacturing costs can be reduced.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of an optical transceiver according to an embodiment of the present invention;

FIG. 2 is a perspective assembled view of the optical transceiver illustrated in FIG. 1, according to an embodiment of the present invention;

FIG. 3 is a perspective view of a circuit device for accommodating the optical transceiver illustrated in FIG. 2, according to an embodiment of the present invention;

FIG. 4 is a plan view illustrating the inside of the optical transceiver illustrated in FIG. 2, according to an embodiment of the present invention;

FIG. 5 is a side view of the optical transceiver of FIG. 4 from a position A in FIG. 4, according to an embodiment of the present invention;

FIG. 6 is a block diagram of an optical transceiver according to another embodiment of the present invention;

FIG. 7 is a plan view illustrating the inside of the optical transceiver illustrated in FIG. 6, according to another embodiment of the present invention; and

FIG. 8 is a side view of the optical transceiver of FIG. 6 from a position A in FIG. 7, according to another embodiment of the present invention.

### BEST MODE

FIG. 1 is a block diagram of an optical transceiver 1 according to an embodiment of the present invention and FIG. 2 is a perspective assembled view of the optical transceiver 1 illustrated in FIG. 1, according to an embodiment of the present invention.

Referring to FIGS. 1 and 2, the optical transceiver 1 converts optical signals  $S_{OPIN\ 1}$  through  $S_{OPIN\ 8}$  of eight channels from a first side, for example, a server, into electrical signals  $S_{EDOUT\ 1}$  through  $S_{EDOUT\ 8}$  so as to output the electrical signals  $S_{EDOUT\ 1}$  through  $S_{EDOUT\ 8}$  to a second side, for example, a client, and converts electrical signals  $S_{EDIN\ 1}$  through  $S_{EDIN\ 8}$  of eight channels from the second side into optical signals  $S_{OPOUT\ 1}$  through  $S_{OPOUT\ 8}$  so as to output the optical signals  $S_{OPOUT\ 1}$  through  $S_{OPOUT\ 8}$  to the first side.

The optical transceiver 1 includes a case 15, single channel light receiving assemblies (ROSA) ROSA 1 through ROSA 8, and single channel light emitting assemblies (TOSA) TOSA 1 through TOSA 8. Here, ROSA is a well-known single channel light receiving assembly and TOSA is a well-known single channel light emitting assembly.

Each of the single channel light receiving assemblies ROSA 1 through ROSA 8 located inside the case 15 includes light receiving devices which detect each of the optical signals  $S_{OPIN\ 1}$  through  $S_{OPIN\ 8}$  of the eight channels from the

first side. Also, each of the single channel light emitting assemblies TOSA 1 through TOSA 8 located inside the case 15 includes light emitting devices operated by the electrical signals  $S_{EDIN}$  1 through  $S_{EDIN}$  8 of the eight channels from the second side.

In other words, opto-electric conversion and electro-optic conversion are respectively performed within each of the single channel light receiving assemblies ROSA 1 through ROSA 8 and the single channel light emitting assemblies TOSA 1 through TOSA 8 located inside the case 15.

A first optical-fiber array connector  $11_T$  and a second optical-fiber array connector  $11_R$  are installed in the first side of the case 15. Accordingly, the optical signals  $S_{OPOUT}$  1 through  $S_{OPOUT}$  8 are output to the first side from the single channel light emitting assemblies TOSA 1 through TOSA 8 through the first optical-fiber array connector  $11_T$ . In addition, the optical signals  $S_{OPIN}$  1 through  $S_{OPIN}$  8 are input to the single channel light receiving assemblies ROSA 1 through ROSA 8 from the first side through the second optical-fiber array connector  $11_R$ .

A circuit substrate 13 is installed in the case 15. The circuit substrate 13 includes transmitting buffers TxIC 1 through TxIC 8 and receiving buffers RxIC 1 through RxIC 8 therein. In addition, an electrical connector  $13_C$  is installed in the second side of the case 15, that is, an end part of the circuit substrate 13.

The electrical signals  $S_{EDOUT}$  1 through  $S_{EDOUT}$  8 are output to the second side from the single channel light receiving assemblies ROSA 1 through ROSA 8 through the receiving buffers RxIC 1 through RxIC 8 and the electrical connector  $13_C$ . In addition, the electrical signals  $S_{EDIN}$  1 through  $S_{EDIN}$  8 are input to the single channel light emitting assemblies TOSA 1 through TOSA 8 from the second side through the electrical connector  $13_C$  and the transmitting buffers TxIC 1 through TxIC 8.

The optical transceiver 1 also includes a guide slot part  $15_S$  disposed in a length direction the case 15. A detailed description thereof will be provided with reference to FIG. 3.

FIG. 3 is a perspective view of a circuit device 3 for accommodating the optical transceiver 1 illustrated in FIG. 2, according to an embodiment of the present invention.

Referring to FIGS. 2 and 3, the circuit device 3 for accommodating the optical transceiver 1 according to an embodiment of the present invention is

included in a system at the second side, for example, a client system. The circuit device 3 includes a guide rail part 31 and a connector-slot 33<sub>S</sub>. That is, the guide rail part 31 included in the circuit device 3 is formed to correspond to the guide slot part 15<sub>S</sub> of the optical transceiver 1 and the connector-slot 33<sub>S</sub> included in the circuit device 3 is formed to correspond to the electrical connector 13<sub>C</sub> of the optical transceiver 1. Accordingly, the optical transceiver 1 according to an embodiment of the present invention can be conveniently inserted into and installed in the circuit device 3.

FIG. 4 is a plan view illustrating the inside of the optical transceiver 1 illustrated in FIG. 2, according to an embodiment of the present invention, and FIG. 5 is a side view of the optical transceiver 1 from a position A in FIG. 4, according to an embodiment of the present invention. In FIGS. 4 and 5, reference numerals 41<sub>T</sub>, 41<sub>R</sub>, 42, and 51 respectively denote transmitting optical fiber lines, receiving optical fiber lines, leads, and the transmitting buffers TxIC 1 through TxIC 8 of FIG. 1.

Referring to FIGS. 4 and 5, the receiving buffers (RxIC 1 through RxIC 8 of FIG. 1) and the transmitting buffers 51 (TxIC 1 through TxIC 8 of FIG. 1) are disposed on the lower surface of the circuit substrate 13. In addition, the single channel light receiving assemblies ROSA 1 through ROSA 8 and the single channel light emitting assemblies TOSA 1 through TOSA 8 are disposed on the upper surface of the circuit substrate 13.

Referring to FIGS. 1, 2, 4, and 5, opto-electric conversion and electro-optic conversion are respectively performed within each of the single channel light receiving assemblies ROSA 1 through ROSA 8 and the single channel light emitting assemblies TOSA 1 through TOSA 8 located inside the case 15, as described above. Accordingly, the following effects can be obtained as described below.

First, optical crosstalk does not occur between adjacent channels.

Second, since a gap between electrical lines, for example, leads 42, connected to each of the single channel light receiving assemblies ROSA 1 through ROSA 8 and the single channel light emitting assemblies TOSA 1 through TOSA 8 can be widened, electrical crosstalk between channels adjacent to each other can be reduced.

Third, since the end parts of the transmitting and receiving optical fibers 41<sub>T</sub> and 41<sub>R</sub> do not need to be arranged to face the single channel light receiving assemblies ROSA 1 through ROSA 8 and the single channel light

emitting assemblies TOSA 1 through TOSA 8 during a process of manufacturing the optical transceiver 1, manufacturing costs can be reduced.

### MODE OF THE INVENTION

FIG. 6 is a block diagram of an optical transceiver 6 according to another embodiment of the present invention.

The optical transceiver 6 illustrated in FIG. 6 is installed in a reduced form of the assembled optical transceiver 1 illustrated in FIG. 2 and thus a related description thereof is omitted. FIG. 7 is a plan view illustrating the inside of the optical transceiver 6 illustrated in FIG. 6, according to another embodiment of the present invention, and FIG. 8 is a side view of the optical transceiver 6 of FIG. 7 from a position A in FIG. 7, according to another embodiment of the present invention. The reference numerals that are the same as those of FIG. 1 included in FIGS. 6 through 8 denote the same function and elements. The reference numeral 62 in FIG. 7 denotes electrical leads.

Referring to FIGS. 6 through 8, the optical transceiver 6 converts optical signals  $S_{OPIN\ 1}$  through  $S_{OPIN\ 4}$  of four channels from a first side, for example, a server, into electrical signals  $S_{EDOUT\ 1}$  through  $S_{EDOUT\ 4}$  so as to output the electrical signals  $S_{EDOUT\ 1}$  through  $S_{EDOUT\ 4}$  to a second side, for example, a client, and converts electrical signals  $S_{EDIN\ 1}$  through  $S_{EDIN\ 4}$  of four channels from the second side into optical signals  $S_{OPOUT\ 1}$  through  $S_{OPOUT\ 4}$  so as to output the optical signals  $S_{OPOUT\ 1}$  through  $S_{OPOUT\ 4}$  to the first side.

The optical transceiver 6 includes single channel light receiving assemblies ROSA 1 through ROSA 4 and single channel light emitting assemblies TOSA 1 through TOSA 4.

Here, ROSA is a well-known single channel light receiving assembly and TOSA is a well-known single channel light emitting assembly.

Each of the single channel light receiving assemblies ROSA 1 through ROSA 4 includes light receiving devices which detect each of the optical signals  $S_{OPIN\ 1}$  through  $S_{OPIN\ 4}$  of the four channels from the first side. Also, each of the single channel light emitting assemblies TOSA 1 through TOSA 4 includes light emitting devices operated by the electrical signals  $S_{EDIN\ 1}$  through  $S_{EDIN\ 4}$  of the four channels from the second side.

In other words, opto-electric conversion and electro-optic conversion are

respectively performed within each of the single channel light receiving assemblies ROSA 1 through ROSA 4 and the single channel light emitting assemblies TOSA 1 through TOSA 4.

The optical signals  $S_{OPOUT}$  1 through  $S_{OPOUT}$  4 are output to the first side from the single channel light emitting assemblies TOSA 1 through TOSA 4 through an optical-fiber array connector 61. In addition, the optical signals  $S_{OPIN}$  1 through  $S_{OPIN}$  4 are input to the single channel light receiving assemblies ROSA 1 through ROSA 4 from the first side through the optical-fiber array connector 61.

The optical receiver 6 also includes a circuit substrate 63. Transmitting buffers TxIC 1 through TxIC 4 and receiving buffers RxIC 1 through RxIC 4 are mounted on the circuit substrate 63. In addition, an electrical connector  $63_C$  is formed on one end part of the circuit substrate 63.

The electrical signals  $S_{EDOUT}$  1 through  $S_{EDOUT}$  4 are output to the second side from the single channel light receiving assemblies ROSA 1 through ROSA 4 through the receiving buffers RxIC 1 through RxIC 4 and the electrical connector  $63_C$ . In addition, the electrical signals  $S_{EDIN}$  1 through  $S_{EDIN}$  4 are input to the single channel light emitting assemblies TOSA 1 through TOSA 4 from the second side through the electrical connector  $63_C$  and the transmitting buffers TxIC 1 through TxIC 4.

The receiving buffers RxIC 1 through RxIC 4 and the transmitting buffers TxIC 1 through TxIC 4 are disposed on the lower surface of the circuit substrate 63. In addition, the single channel light receiving assemblies ROSA 1 through ROSA 4 and the single channel light emitting assemblies TOSA 1 through TOSA 4 are disposed on the upper surface of the circuit substrate 63.



## CLAIMS

1. An optical transceiver which converts optical signals of a plurality of channels input from a first side into electrical signals so as to output the electrical signals to a second side and converts electrical signals of a plurality of channels input from the second side into optical signals so as to output the optical signals to the first side, the optical transceiver comprising:

a case;

single channel light receiving assemblies located inside the case, comprising light receiving devices for detecting the optical signals of the channels from the first side; and

single channel light emitting assemblies located inside the case, comprising light emitting devices operated by the electrical signals of the channels from the second side.

2. The optical receiver of claim 1, wherein the single channel light receiving assemblies are receiver optical sub-Assemblies (ROSA) and the single channel light emitting assemblies are transmitter optical sub-assemblies (TOSA).

3. The optical receiver of claim 1, wherein the case comprises a first optical-fiber array connector and a second optical-fiber array connector on the first side, the optical signals output to the first side from each of the single channel light emitting assemblies through the first optical-fiber array connector and the optical signals input to each of the single channel light receiving assemblies from the first side through the second optical-fiber array connector.

4. The optical receiver of claim 3, wherein the case comprises an electrical connector on the second side, the electrical signals output to the second side from each of the single channel light receiving assemblies through receiving buffers and the electrical connector, and the electrical signals input to each of the single channel light emitting assemblies from the second side through the electrical connector and transmitting buffers.

5. The optical receiver of claim 4, wherein the case comprises a circuit substrate on which, the receiving buffers and the transmitting buffers are

disposed on a lower surface thereof and the single channel light receiving assemblies and the single channel light emitting assemblies are disposed on an upper surface thereof.

6. The optical receiver of claim 5, wherein the electrical connector is formed on an end part of the circuit substrate.

FIG. 1

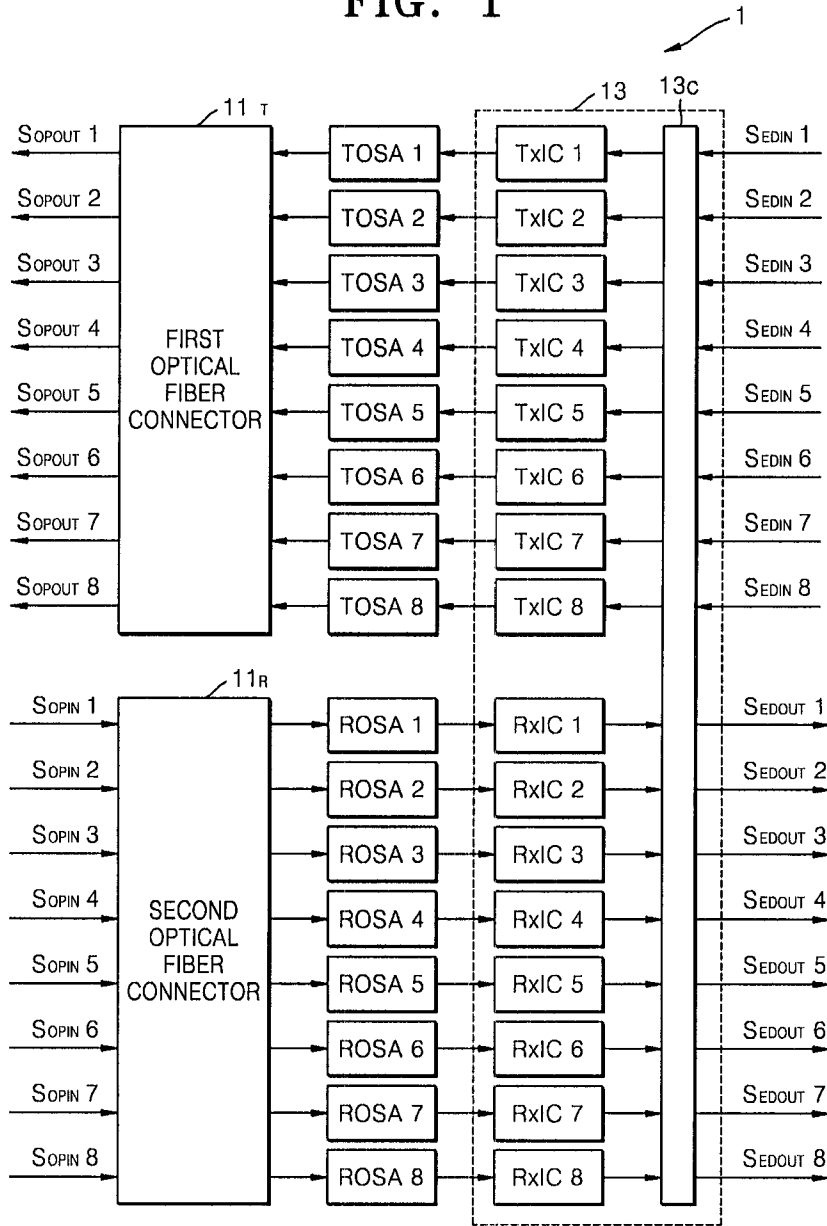


FIG. 2

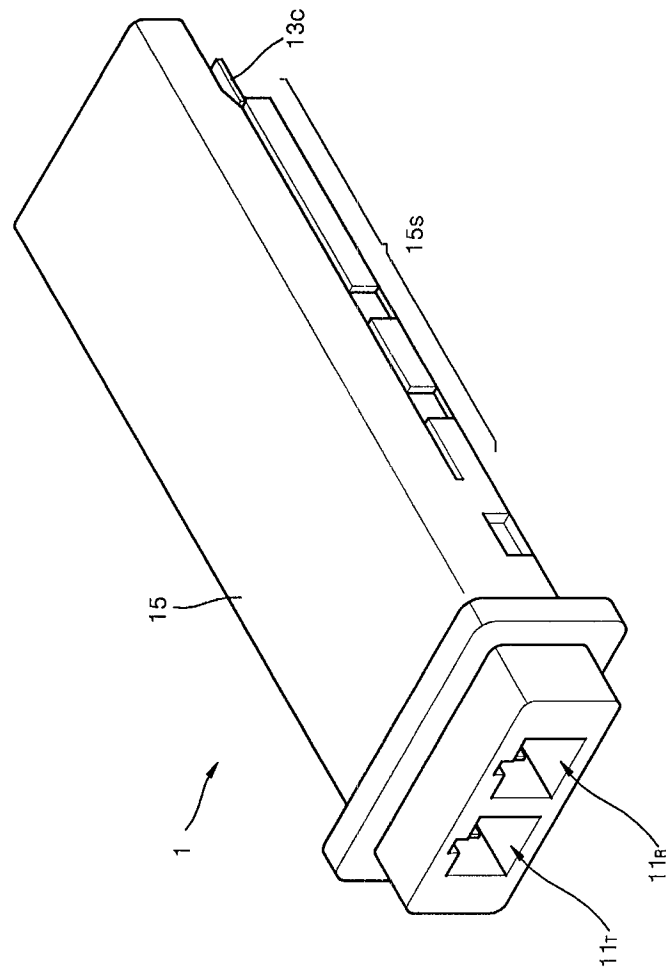
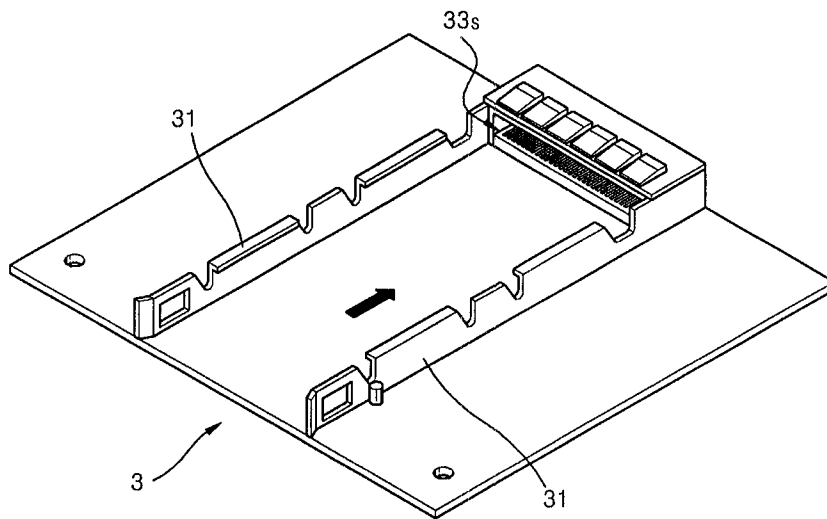


FIG. 3



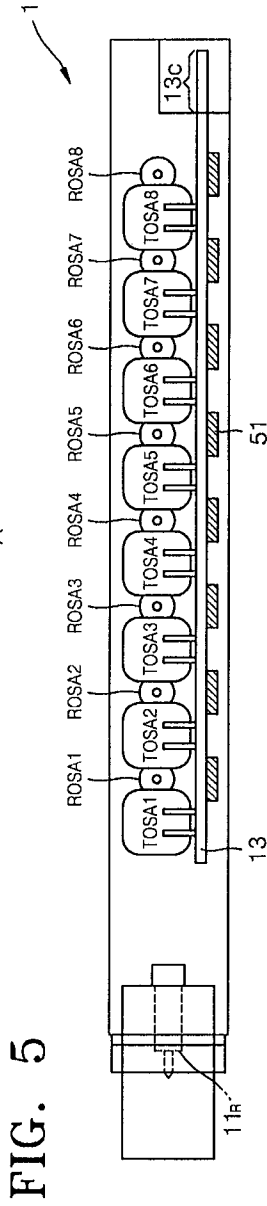
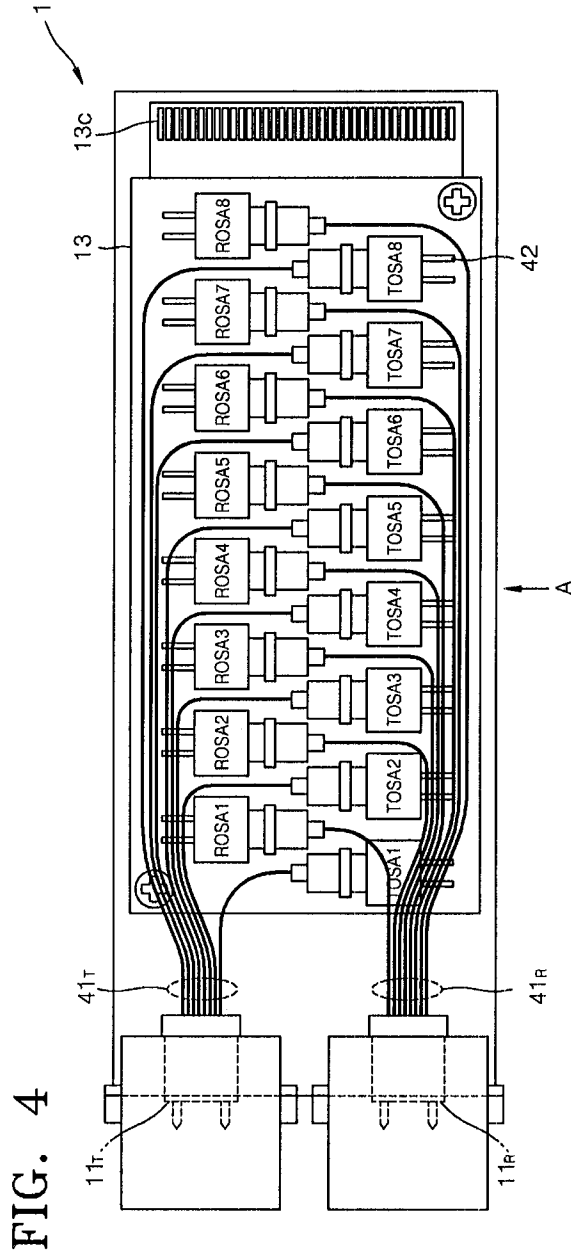
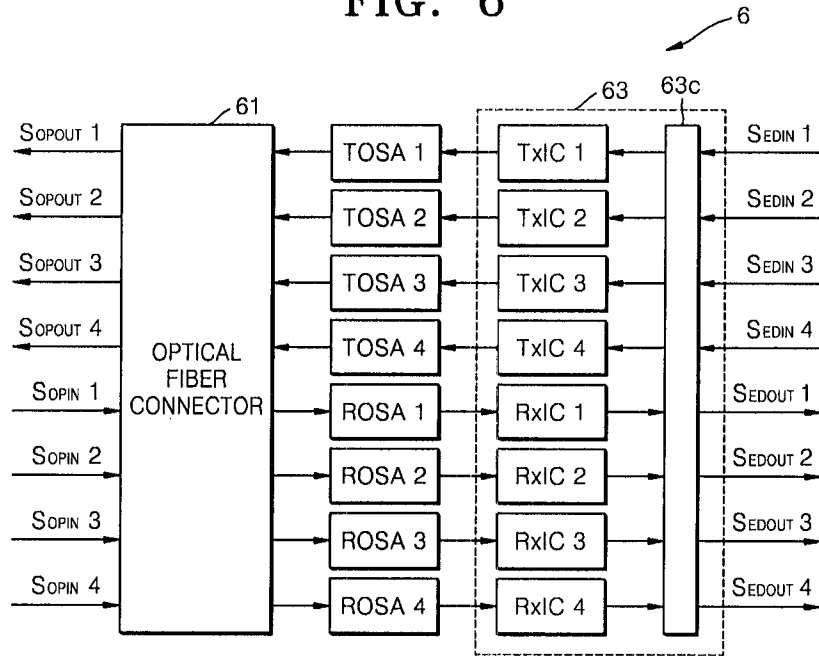
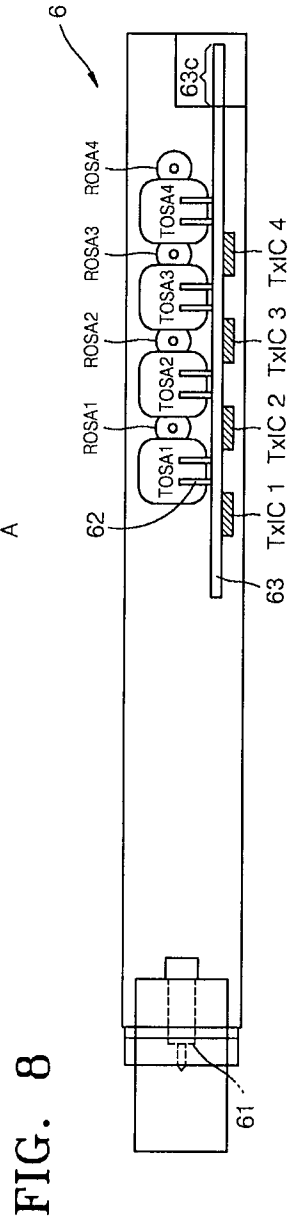
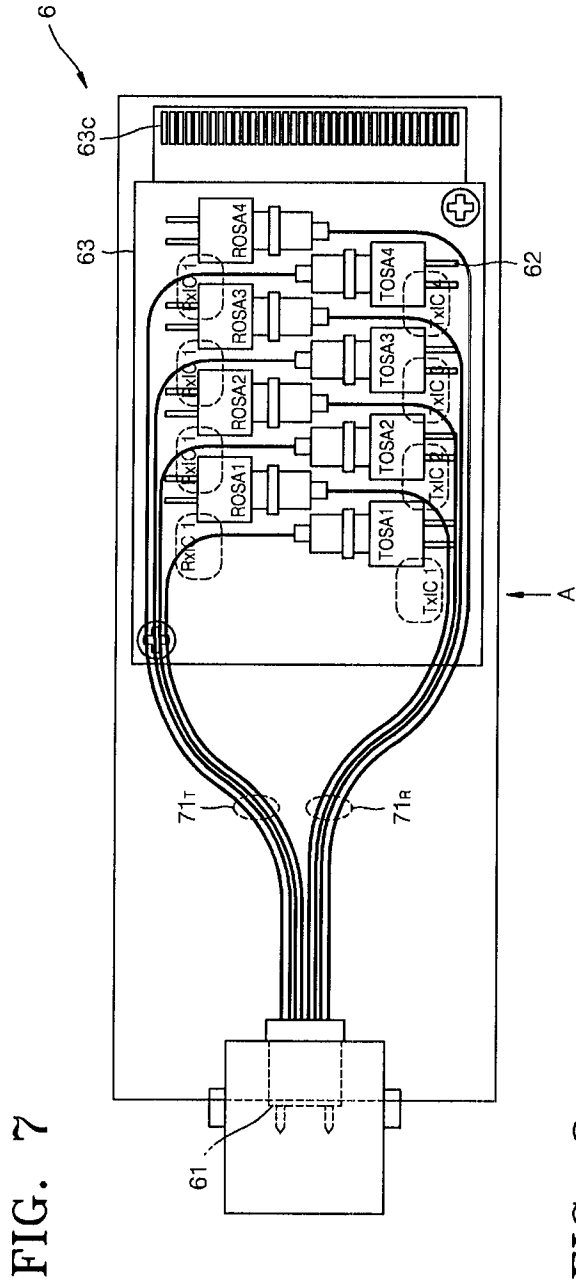


FIG. 6







## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/KR2007/006312****A. CLASSIFICATION OF SUBJECT MATTER****G02B 6/36(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 G02B 6/36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility Model and applications for Utility Model since 1975 : IPC as above

Japanese Utility Model and applications for Utility Model since 1975 : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS(KIPO internal) "Keywords : transceiver, multi, plural, case, housing and similar terms"

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X A	US 2005-0089281 A1 (CHIU, C. et al.) 28 Apr. 2005 See claims 1-7 and figures 2, 3, 5, 7	1-4 5,6
X A	US 6540414 B1 (BREZINA, J. R. et al.) 01 Apr. 2003 See column 9, line 3 - column 10, line 12 and figure 1	1, 3 2, 4-6
X A	US 2005-0226571 A1 (MALAGRINO JR., G. D. et al.) 13 Oct. 2005 See paragraphs 18-23 and figures 3, 4	1, 2 3-6
A	US 6811326 B2 (KEEBLE, D. J. et al.) 02 Nov. 2004 See column 2, line 53 - column 5, line 8 and figures 1-10	1-6

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

11 FEBRUARY 2008 (11.02.2008)

Date of mailing of the international search report

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Telephone No. 82-42-481-8531



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/KR2007/006312**

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